COAL

DES-BEE-DOVE MINES
C/015/017
PHASE 1 & 2 RECLAMATION PLAN
SOIL MANAGEMENT PLAN

NOVEMBER 2001

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ENERGY WEST Mining Co.
PO Box 310
Huntington, Utah 84528

COPY

November 28, 2001

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C/015/017

Utah Coal Program
Utah Division of Oil, Gas, and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

Subject: Requested Clean Copies - Soil Management Plan for the Des Bee Dove Mine, C/015/017-N01-7-1-1

PacifiCorp, by and through its wholly-owned subsidiary, Energy West Mining Company ("Energy West") as mine operator, hereby submits four clean copies of the approved Soil Management Plan (refer to conditional approve letter dated November 16, 2001 [C/015/017-AM01C-1]).

If there are any concerns or questions, please call me a (435) 687-4720 or Dennis Oakley at (435) 687-4825.

Sincerely,

Charles A. Semborski
Geology/Permitting Supervisor

cc: Carl Pollastro (EWMC)
File

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Soil Trenching and Management Plan

As described in the R645-301-200, soils of the Des-Bee-Dove area are very limited. The physiographic setting (steep south facing topography) and precipitation events of short duration limit the accumulation of a well developed soil sequences. Slopes of the Des-Bee-Dove are covered with a thin layer of detritus material ranging from clay to moderate size boulders. Several colluvial fan deposits forming large lobes occur within the disturbed area. Colluvial fan deposits consist of well cemented conglomerated material ranging from clay to boulders. Several roadcuts have been developed through colluvial fan deposits with near vertical slopes. Bedrock outcrop sequences of the lower Blackhawk, Star Point Sandstone and Mancos Shale formations are exhibited throughout the disturbed area. The following plan will be included in Phase 1 and Phase 2 reclamation operations.

Soil Trenching: To assess the quality of the substitute topsoil available for final reclamation for Phase 1 and 2, PacifiCorp has conducted several soil sampling programs (refer to Phase I and Phase II: R645-301-200, Appendix A for soil quality tabulation and laboratory results). To quantify the substitute topsoil availability, PacifiCorp proposes to excavate a total of ten soil trenches in the pre-SMCRA cuts and fills (refer to R645-301-200 Map 2-15 and site descriptions listed below). In addition, trenches will be developed in the spoil material excavated during the 2001 tipple pad coal removal project (bathouse area) and a test pit will be excavated in the substitute soil pile segregated at the Deseret coal storage area. Trenches will be excavated with a backhoe to bedrock or to the proposed post reclamation elevations. The trenches will be excavated to permit safe entry, minimize the potential of sidewall failure, and eliminate the potential of trapping livestock and wildlife. PacifiCorp will notify the Division upon the initiation of the soil trenching. Trenches will be backfilled upon completion of documentation and sampling process.

Soil Trench Locations and Descriptions

Des-Bee-Dove Tipple Area - Main Access Road

One trench will be excavated near the Des-Bee-Dove main access road developed during the valley excavation project. Trenching will be parallel to the main access road. The purpose of trench is to determine the availability of potential substitute topsoil.

Bathhouse Pad Area

Three trenches will be developed on the bathhouse pad perpendicular to the pre-SMCRA cut slopes. Trenching will be initiated on the pad approximately half way between the exposed cut wall and the guardrail and penetrate the fill slope to

extent practical. The purpose of these trenches is to assess the bedrock interface and to determine the availability of potential substitute topsoil. One of the trenches will bisect the coal waste material generated during the valley fill coal removal project.

Deseret Mine Area

One trench will be excavated near the Deseret Mine belt/return portals perpendicular to the coal outcrop. Trenching will be parallel to the proposed drainage channel and extend to the coal storage fill slope. The purpose of trench to assess the bedrock interface, assist in channel design and to determine the availability of potential substitute topsoil.

Deseret Mine Coal Storage Area

One trench will be excavated through the base of the Deseret Mine Coal Storage Area perpendicular to the proposed channel. Trenching will extend from the northern exposure of the Spring Canyon Member of the Star Point Sandstone south to the current access road. The purpose of trench to assess the bedrock interface, potential coal waste, assist in channel design and to determine the availability of potential substitute topsoil. In addition to the trenching, a soil test pit will be excavated in the potential substitute soil pile segregated during the coal excavation project.

Little Dove/Beehive Access Road

One trench will be excavated near the switchback to assess the bedrock interface and to determine the availability of potential substitute topsoil. The fill material is a potential source of substitute soil for road cut elimination.

Little Dove/Beehive Mine Area

Two trenches will be excavated between the Little Dove and Beehive mines portals perpendicular to the coal outcrop. The first trench will parallel to the proposed drainage channel and extend from the Beehive Mine portal area to the fill outslope and the second trench will be perpendicular to the first trench and extend from the first trench to the Little Dove portal area. The purpose of the trenching is to assess the bedrock interface, assist in channel design and to determine the availability of potential substitute topsoil.

Little Dove/Beehive Substation Area

One trench will be excavated near the substation area to assess the bedrock interface and to determine the availability of potential substitute topsoil. The fill material is source of substitute soil for the substation cutslope elimination.

Soil Sampling and Documentation: Qualified personnel will document the exposed sequences and cross sections will be developed to assist volume calculations. Samples will be collected to evaluate the acid and/or toxic forming potential of the coal mine waste on site and to locate and characterize substitute topsoil material within the disturbed area. Sample locations have been selected to allow the best characterization of the substitute soil and coal waste material.

Reporting of Technical Data

- Original Laboratory sheets with the results from the sampling will be submitted to the Division upon completion of the trenching project.
- Record all field information on the NRCS 232 form.
- Energy West will utilize qualified personnel to direct the field work, for collection of representative soil samples, and evaluation analytical results.
- Energy West will summarize sample results and revise the soil management plan base upon the results of the soil sampling.

Several soil surveys have been conducted in the disturbed and adjacent areas. With the exception of selected parameters in sites SS-6 and SS-7, slightly elevated SAR values, the physio-chemical properties of the detritus deposits, disturbed overburden and coal waste, are relatively similar (refer to Phase 1 and Phase 2 Reclamation Plans: R645-301-200 Soil Section for quality summary and laboratory analysis). Analytical data from Cottonwood and Deer Creek mines show a similar pattern. Based upon this data, compositing of samples of similar material is recommended. Composting similar material within each trench will allow characterization of large volume for a reasonable cost. If distinct or unique material is uncovered during the excavation process, this material will be sampled separately and the approximate volume will be denoted during the survey.

Based on visual comparison and input from the Division staff, similar material from each trench will be composited onsite. It is proposed that a total of twenty (20) overburden/substitute topsoil samples be collected (two per trench) and depending upon the material encountered, up to a total of ten (10) coal debris/waste. The samples will be submitted to a certified laboratory and analyzed as outlined in the following tables (copied from the Technical Analysis dated October 3, 2001).

Table 1. Parameters for Characterization of the Des Bee Dove Mine Site Soils*

Test to be Performed	Reported As	Suggested Methods
pH	saturated paste standard units	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 14, page 420 and Chapter 16, page 487.
Saturation %	%	Ibid. Chapter 14, pp 420 - 422.
EC_e	dS/m @ 25°C (or mmhos/cm)	Ibid. Chapter 14, pp 420 - 422 and pp 427 - 431.
Soluble Na, K, Mg, Ca	meq/L	Ibid. Chapters 14 pp 420-422 (saturation extract);Chapter 19 pp 555-557; Chapter 20 pp586-590 (spectroscopic methods).
ALKALINITY OF THE SATURATION EXTRACT	HCO_3^- as mg/L $CaCO_3$	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods.[1] 1998. v 4.10. p 19. (Saturation Paste Extract Alkalinity, titration with 0.02N HCl)
Available NO_3-N	mg/Kg	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 38. p 1129 (KCl extraction). For analysis follow: Sims, J.R. and G.D. Jackson. 1971. Rapid Analysis of Soil Nitrate with Chromotropic Acid. Soil Sci. Soc. Am. Proc. 35-603-606.
Available Phosphorus	mg/Kg	Soil Science Society of America. 1996. Series No. 5. Methods of Soil Analysis: **Part 3** - Chemical Methods. Chapter 32, page 895. ($NaHCO_3$ Extraction.)
Particle Size Analysis	% sand, **very fine sand**, silt, and clay	Soil Science Society of America. 1986. Series No. 5. Methods of Soil Analysis: **Part 1** - Physical and Mineralogical Methods. Chapter 15 pp 398 and 404-409 (Hydrometer Method).
Organic Matter	%	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods. 1998. v 4.10. p 86. (Loss on Ignition, convert %LOI to OM by regression intercept value as noted in method)
$CaCO_3$ %	%	Ibid. p. 99 (Soil Carbonates, Gravimetric Determination after extraction with 3 M HCl.) Total Inorganic Carbon = %$CaCO_3$ x 0.12.

* Exchangeable Sodium Percentage will be analyzed when the SAR values are greater than 15 for clay textures and 20 for coarse textured soils.

[1] From: Plant, Soil and Water Reference Methods for the Western Region. 1994. R.G. Gavlak, D.A. Horneck, and R.O. Miller. WREP 125.

Table 2. Additional Analyses Required to Characterize Des Bee Dove Refuse/Coal Mine Waste

PARAMETERS	Reported As	RECOMMENDED METHOD
Total Organic Carbon	%	Western States Laboratory Proficiency Testing Program Soil and Plant Analytical Methods. 1998. v 4.10. p 88. (Combustion Method)
Acid Potential	% pyritic S	U.S. EPA, 1978, EPA 600/278-054. Method 3.2.6, pg 60
Neutralization Potential	% $CaCO_3$	U.S. EPA, 1978, EPA 600/278-054. Method 3.2.3, pg 47

Field Parameters

- Energy West will record all field information on the NRCS 232 form as outlined in the following table (copied from the October 3, 2001 TA)
- Energy West will utilize qualified personnel to direct the field work, soil sampling and creating composites from samples taken.

Table 3. Field Parameters For Characterization of the Des Bee Dove Mine Site Soils

Test to be Performed	Reported As	Suggested Methods
Texture	%sand, silt, clay	U.S. Department of Agriculture, Natural Resource Conservation Service, 1998. Field Book for Describing and Sampling Soils, Version 1.1. p 2-28 -2-31.
Structure/Consistence	grade, size, type	Ibid. p 2-38 through 2-51.
Visual Estimate % Coal	% area & size fragments	Ibid. p 2-20, 2-26, 7-1, 2-29, and 2-37.
Internal Rock	% volume & size fragments	Ibid. p2-32 through 2-37 and p2-20 and p 2-26.
Surface Rock	% cover & size fragments	Ibid. loc cit.
Soil Color	Hue Value/Chroma	Ibid. p 2-7 through 2-15.
Chemical Response	Effervescence	Ibid. p 2-65.
	Gypsum	U.S. Salinity Laboratory Staff. 1954. Diagnosis and improvement of saline and alkali soils. USDA Handbook 60. Method 22a. p102.

In addition to the field parameters outlined in the previous table, the Division recommended estimating Available Water Capacity based on the soil types and properties. As outlined in the October 3, 2001 TA; soil properties include particle size, soil pores, organic matter, clay type, soil structure, and coarse fragment (gravel, cobble, and stone). The table below contains average values of available water holding capacity for various soil textural classes. These values may be used in-lieu of direct measurements. These estimated values should correlate with the laboratory report for the soil's Saturation Percentage.

Table 4: Texture and AWC*

Soil Texture	Available Water Capacity cm^3/cm^3
Clay	0.14 – 0.16
Silty Clay	0.15 – 0.17
Sandy Clay	0.15 – 0.17
Silty Clay Loam	0.19 – 0.21
Clay Loam	0.19 – 0.21
Sandy Clay Loam	0.14 – 0.16
Silt Loam	0.19 – 0.21
Loam	0.16 – 0.18
Very Fine Sandy Loam	0.15 – 0.17
Fine Sandy Loam	0.13 – 0.15
Sandy Loam	0.11 – 0.13
Loamy Fine Sand	0.09 – 0.10
Loamy Sand	0.06 – 0.08
Fine Sand	0.05 – 0.07
Sand	0.06

*adapted from Estimation of Soil Moisture Holding Capacity. USDA Forest Service, Southwestern Region. March 1970.

As stated in the October 3, 2001 TA, coarse fragments in the soil (gravel, cobble, and stone) occupy volume and, therefore, reduce the amount of water held in the soil. However, the percent reduction in AWC is not equal to the volume occupied by the coarse fragments since the coarse fragments themselves retain some moisture. The following equation will be used to estimate the percent

reduction of AWC based on coarse fragment percent:

$$\% \text{ AWC Reduction} = 1.51[\% \text{ coarse fragment}]$$

Finally, AWC is reduced by salts in the soil solution. As a rough guide, reduce the AWC by 25 percent for each 4 mmhos/cm EC of the saturated extract (USDA-NRCS, 1993).

Along with AWC, the Division requested that Energy West provide the K-factor values of the soil. As stated in the October 3, 2001 TA, soil erodiblity factor ("K") is a numeric representation of the ability of soils to resist erosion and susceptibility of soil particle detachment by water.

For disturbed soils, substitute soils and unpublished soils, the soil erodibility (K) factor must be calculated from the following soil characteristics:

- percent silt and very fine sand
- percent sand
- percent organic matter
- soil structure and
- soil permeability.

The K factor will be derived using a nomograph located in the National Soils Handbook Title 430 Part 618, Soil erodibility factors, USLE, RUSLE, exhibit 618.12 or from the following equation:

$$\text{K factor} = [(0.00021)(M^{1.14})(12 - a) + (3.25)(b - 2) + (2.5)(c - 3)] / 100$$

where M = (% silt + % very fine sand)(100 - % clay)
a = % organic matter
b = structure code is as follows: 1 = very fine granular; 2 = fine granular; 3 = medium or coarse granular; and 4 = blocky, platy, or massive
c = permeability code

Evaluation Criteria for Suitability of Soils

The following table will be utilized to evaluate suitability of potential substitute soil (reproduced from October 3, 2001 TA):

Table 4: Substitute Topsoil Suitability Evaluation

CRITERIA	GOOD	FAIR	POOR	UNACCEPTABLE
Saturation %	25 to 80		<25 >80	
PH	6.1 to 8.2	5.1 to 6.1 8.2 to 8.4	4.5 to 5.0 8.5 to 9.0	< 4.5 > 9.0
EC (mS/cm 25°C)	0 to 4	4 to 8	8 to 15	> 15
SAR [a,b]	0 to 4	5 to 10	10 to 15	> 15 [a]
$\%CaCO_3$	<15	15 - 30	>30	
Texture [c]	sl, l, sil, scl, vfsl, fsl	c, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
Total Organic Carbon	<10%			≥10%
Available Water Capacity[d]	> 0.10 moderate	0.05 to 0.10 low	< 0.05 very low	
K factor[e]	< 0.37		> 0.37	
Acid/Base Potential				$\leq \frac{0 \text{ tons } CaCO_3}{1000 \text{ tons}}$

[a] For clay textured soils unacceptable is SAR >14. For sandy textured soils unacceptable is >20.

[b] For most Western soils, the SAR to ESP relationship is usually 1:1, up to ESP ≈ 20. If SAR>20, then determine ESP. (Evangelou, 2000.)

[c] s=sand, l= loam, si= silt, c= clay, v= very, f= fine, co=coarse, g=gravel

[d] Available Water Capacity is adjusted for texture.

[e] K factor recommendations from the USDA Soil Conservation Service.1978. National Soils Handbook Notice 24. (3/31/78). NSH Part II –403.6(a).

Soil Management: Soil trenching will assess areas of potential substitute soil resources in both the cut/pad, valley excavated material and fill slope areas. Based upon the results of the soil trenching, PacifiCorp will develop a soil management and distribution plan for both Phase 1 and 2 reclamation projects. Identified areas of substitute soil will be excavated, segregated and stored separately during the reclamation process. Phase 1 and 2 reclamation will be a dynamic process, soil resource storage areas will be selected to not impact backfill and grading activities and minimize re-handling.

As specified in the slope stability study conducted by RB&G Engineering, excavated fill material will be sorted and classified by size consistency (refer to R645-301-500, Backfill and Grading section). To achieve stability, the upper layer of slopes greater than 2H/1V will consist coarse fragments (maximum size 30", less than 20% minus 1"), and soil placement will be limited to isolated areas between the rock armoring.

The following table lists the approximate acerage of soil distribution for Phase 1 and 2 on developed slopes of 2H:1V or less:

Table 5: Phase 1 and 2 Estimated Soil Distribution Acerage

Location	Acerage	Estimated Required Soil Volume[1] (Cubic yards)
Phase 1 Little Dove/Beehive Area[2]		
Portal Area[3,4]	**2.6**	**2,100**
Phase 2 Deseret Mine,Tipple, and Bathhouse Area[2]		
Deseret Mine,Tipple, and Bathhouse Area[4,5]	**11.0**	**8,900**

[1] Estimated Soil Volume (area multiplied by 0.5 feet for minimum soil depth)
[2] Area estimated on Phase 1 and 2 Reclamation plans, excludes reconstructed drainages
[3] Excludes access roads and water storage area
[4] Area based on 2H:1V slopes, volume reduced if 1½ H:1V slopes are constructed. Final slope configuration will be based on interception of bedrock and final channel design.
[5] Excludes main access road and previously re-vegetated areas